How to install the software for the A1 RPLIDAR
For use on Ubuntu 20.04

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For this installation, I followed the youtube tutorial that can be found using this link,

▶ How to use SLAMTEC RPLidar in ROS2?
https://www.youtube.com/watch?v=JSWcDe5tUKQ
Other important links to have open when following the tutorial

https://wiki.ros.org/noetic/Installation/Ubuntu

https://docs.ros.org/en/humble/Installation/Ubuntu-Install-Debs.html

https://github.com/Slamtec/rplidar_ros/tree/ros2-devel

Note: In order to follow this tutorial, you must have VMware and Ubuntu 20.04 installed on your computer or other related device such as a Raspberry Pi 4

Step 1, Install Ros2 on Ubuntu 20.04

Using a browser, open the link:
https://docs.ros.org/en/humble/Installation/Ubuntu-Install-Debs.html
Now open the terminal on the virtual machine.
Now use the following commands:

```
locale  # check for UTF-8

sudo apt update && sudo apt install locales
sudo locale-gen en_US en_US.UTF-8
sudo update-locale LC_ALL=en_US.UTF-8 LANG=en_US.UTF-8
export LANG=en_US.UTF-8

locale  # verify settings
```

Then setup the Ubuntu Universe Repository by using the following commands.

```
sudo apt install software-properties-common
sudo add-apt-repository universe
```

Note: if prompted with a Y/N to continue, select Y and hit enter.
            This applies for all future Y/N prompts.

Now add the ROS 2 GPG key with apt. By using the following commands.

```
sudo apt update && sudo apt install curl -y
```

Note, this is one command line.

```
sudo curl -sSL
https://raw.githubusercontent.com/ros/rosdistro/master/ros.key -o
/usr/share/keyrings/ros-archive-keyring.gpg
```

Then add the repository to your sources list. By using the following command.
Note, this is one command line.

```
echo "deb [arch=$(dpkg --print-architecture)
signed-by=/usr/share/keyrings/ros-archive-keyring.gpg]
http://packages.ros.org/ros2/ubuntu $(. /etc/os-release && echo
$UBUNTU_CODENAME) main" | sudo tee /etc/apt/sources.list.d/ros2.list >
/dev/null
```

Install ROS 2 packages

Update your apt repository caches after setting up the repositories.

```
sudo apt update
```

ROS 2 packages are built on frequently updated Ubuntu systems. It is always recommended that you ensure your system is up to date before installing new packages.

```
sudo apt upgrade
```

Desktop Install (Recommended): ROS, RViz, demos, tutorials.

```
sudo apt install ros-humble-desktop
```

The above code is from the tutorial, you must change "humble" to "foxy"

```
sudo apt install ros-foxy-desktop
```

This is the last step in part 1.

Step 2, Download and compile RPLidar ROS package
To start this process, run the following command.

```
Sudo apt install ros-dev-tools
```

Now open https://github.com/Slamtec/rplidar_ros/tree/ros2-devel
Now use the following commands.

```
mkdir -p ~/ros2_ws/src
cd ~/ros2_ws/src
```

Now use the following command to install git tool.

```
Sudo apt install git
```

Clone rplidar_ros package from github
Note: Ensure you're still in the ros2_ws/src directory before you clone:

```
git clone -b ros2 https://github.com/Slamtec/rplidar_ros.git

cd ~/ros2_ws/
source /opt/ros/<rosdistro>/setup.bash
```
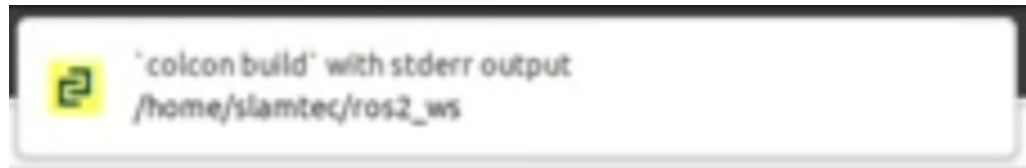
Now compile.

```
colcon build --symlink-install
```

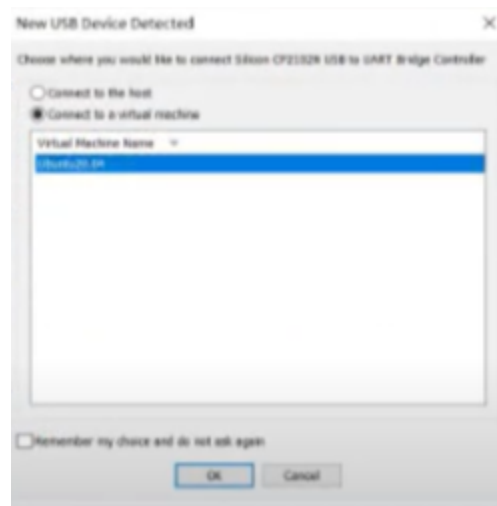Note, If a pop up like this showes up, then you know the setup was successful.

This will complete step 2

Step 3, Connect RPLidar

With the terminal window open and in the ~/ros2_ws directory perform the following:

Connect the RPLidar, then select the virtual machine option when the window   pops up.

Now that the RPLidar is connected, run the following command:

```
sudo dmesg
```

After running this command the last line should let you know if the connection was successful and what USB port it is connected to.

Now you must run the following command to enable the use of the USB port.

```
Sudo chmod 666 /dev/port_id
```

Note! In the command, change "port_id" to the ID listed in the terminal window, it should resemble the following: ttyUSB0. The command will look something like:

```
Sudo chmod 666 /dev/ttyUSB0
```

The RPLidar should be operational now once you perform the last step.

Step 4, Run RPLidar ROS package

To ensure that the software is setup properly run the following command
Note: the startup process will be the same every time.

```
cd ~/ros2_ws
source ./install/setup.bash
ros2 launch rplidar_ros view_rplidar_a1_launch.py
```

At this point the RPLidar should be running and you will see a window like the following image.